Self-operated Pressure Regulators

Type 2357-31 Pressure Build-up Regulator

with safety function and integrated excess pressure valve

Type 2357-31 with non-return unit at port C
Ports A and B with soldering nipple with ball-type bushing

Mounting and Operating Instructions

EB 2558 EN

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Definition of signal words

DANGER!
Hazardous situations which, if not avoided, will result in death or serious injury

WARNING!
Hazardous situations which, if not avoided, could result in death or serious injury

NOTICE
Property damage message or malfunction

Note:
Additional information

Tip:
Recommended action

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1 General safety instructions

– The regulators are to be mounted, started up or serviced by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. Make sure employees or third persons are not exposed to any danger.

– All safety instructions and warnings given in these mounting and operating instructions, particularly those concerning installation, start-up and maintenance, must be strictly observed.

– According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

– The regulators comply with the requirements of the European Pressure Equipment Directive 97/23/EC. The declaration of conformity issued for a regulator bearing the CE marking includes information on the applied conformity assessment procedure. The declaration of conformity is available on request.

– To ensure appropriate use, only use the regulator in applications where the operating pressure and temperatures do not exceed the specifications used for sizing the regulator at the ordering stage.

– The manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.

– Any hazards that could be caused in the regulator by the process medium, operating pressure or by moving parts are to be prevented by taking appropriate precautions.

– Proper transport, storage, installation, operation and maintenance are assumed.

2 Process medium and scope of application

Pressure regulator for cryogenic gases and liquids.

Operating pressures up to 50 bar, with set points from 1 to 40 bar. Temperature range from –196 to +200 °C. Oxygen clean according to international standards and guidelines.

The regulators are designed to keep the pressure constant to the adjusted set point, especially in cryogenic plants.

The regulator functions as a pressure build-up regulator with safety function (direction of flow from A to B, closing) or as an excess pressure valve (direction of flow from B to C, opening).

WARNING!
Risk of injury and property damage due to high pressure in the plant!
A suitable overpressure protection must be installed on site in the plant section.

2.1 Transportation and storage

The regulators must be carefully handled, transported and stored. Protect the regulators against adverse influences, such as dust, dirt or moisture before they are installed.

In the delivered state, the regulators are packed to be free of oil and grease for oxygen service. To avoid contamination, do not open the packaging until immediately before installation.

3 Design and principle of operation

See Fig. 1 on page 7.

Depending on the direction of flow, the regulator functions as a **pressure build-up regulator with safety function** (A → B) or as an **excess pressure valve** (B → C). The position of the pressure build-up plug (2.1) determines the flow rate across the area released between the plug and seat.

The pressure regulator is designed to keep the pressure constant to an adjusted set point, especially in cryogenic plants.

The regulators consists of a valve with three ports (A, B, C), spring-loaded operating diaphragm (3) with set point adjuster (10) and pressure build-up plug (2.1).

Pressure build-up regulator
Direction of flow from port A to port B. The valve is open when no pressure is applied. The pressure at port B is transmitted to the operating diaphragm (3). The positioning force produced moves the pressure build-up plug (2.1) depending on the spring force adjustable at the set point adjuster (10). The valve closes as soon as the pressure downstream of the valve has assumed the adjusted set point.

Pressure build-up regulator with safety function
The regulator additionally functions as a safety valve for the pressure chamber upstream of port A. When the pressure exceeds the set point by approx. 5 bar, the positioning force overcomes the force of the closing spring (16), causing the pressure build-up plug to open and the pressure to be relieved to ports B and C.

Excess pressure valve
Direction of flow from port B to port C. The plug seals off the operating diaphragm (3) when there is no pressure drop across port B and C (valve closed).

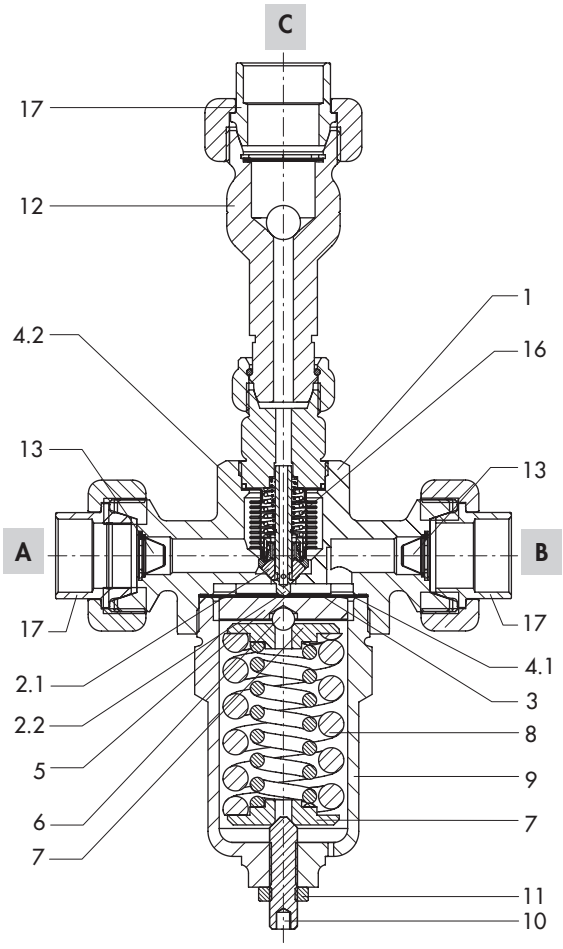
The pressure at port B is acts on the operating diaphragm (3). The positioning force produced by this pressure opposes the adjustable spring force of the set point springs (8) and opens the tubular plug (2.2) when the pressure rises above the set point by approx. 0.5 bar. The pressures are equalized and the medium escapes through the inside of the plug over port C.

The regulator can be optionally equipped with a non-return unit (12). It prevents the medium from flowing back to port C and allows maintenance work to be performed on the regulator without having to empty the tank first.

To connect the regulator to the pipelines containing the process medium, soldering nipples with ball-type bushings (17) are available as accessories.

EC type examination

An EC type examination according to the Pressure Equipment Directive 97/23/EC, Module B has been performed on the regulators.



Type 2357-31

1 Valve body
2.1 Pressure build-up plug
2.2 Tubular plug
3 Operating diaphragm
4.1 Seal (bottom section of the body)
4.2 Seal (top section of body)
5 Diaphragm plate
6 Ball
7 Spring plate
8 Set point springs
9 Bottom section of the body (spring housing)
10 Set point adjuster (hexagon socket, size 5 mm)
11 Lock nut (size 17 mm)
12 Non-return unit (accessories)
13 Filter
16 Closing spring
17 Soldering nipple with ball-type bushing (accessories)

Fig. 1: *Functional diagram*

4 Installation

In the delivered state, the regulators are packed to be free of oil and grease for oxygen service.

WARNING!
Use of oil and grease in oxygen atmospheres!
Risk of explosion!
Make sure that the regulator is absolutely clean and free of oil and grease on installing it.

Flush and clean the pipeline thoroughly before installing the regulator.

- Make sure the regulator is installed free of stress.
- Install a strainer upstream of the regulator.

  Otherwise, impurities in the pipeline may impair the proper functioning of the valve, above all the tight shut-off.

4.1 Mounting position

Install the regulator (port C facing upward) with its main axis in the vertical position.

Install the pressure regulator with the actuator housing suspended downward. Observe the flow direction.

Used as ...

- **Build-up pressure regulator** with safety function: direction of flow from port **A** to port **B**
- **Excess pressure valve**: Direction of flow from port **B** to port **C**

The ports A and B are marked on the body.

Required spare parts and accessories are listed in Data Sheet ▶ T 2570 EN.

4.2 Shut-off valves

We recommend installing a hand-operated shut-off valve both upstream and downstream of the regulator. This allows the plant to be shut down for cleaning and maintenance, and when the plant is not used for longer periods of time.

Install a pressure gauge at a suitable point to monitor the pressures prevailing in the plant.

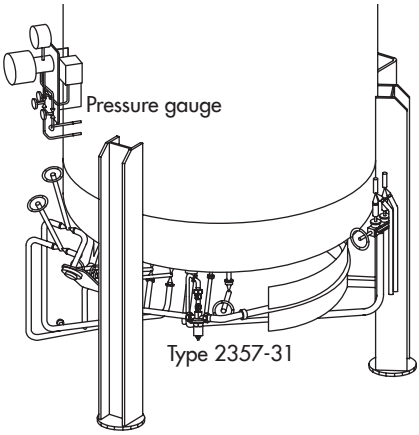


Fig. 2: *Typical application*

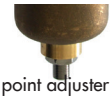
5 Operation

See Fig. 1 on page 7.

5.1 Start-up

First start up the regulator after mounting all parts.

5.2 Set point adjustment


Set point adjuster

Every pressure regulator is delivered with the set point listed in Table 1 already adjusted.

Turn the set point adjuster (10) using Allen key (width across flats 5 mm) to change the default set point.

Provided a pressure gauge has been installed at a suitable point in the plant, the required set point can be directly adjusted while monitoring the pressure reading at the gauge.

When a pressure gauge is not installed, adjust the set point using the adjustment diagram Fig. 3 on page 10.

To increase the set point, turn the set point adjuster into the body (↻) and out of the body (↺) to reduce it.

> ***NOTICE!***
> *Set point adjuster screwed too tight! The regulator is blocked and the medium flow through it is restricted. Pressure regulation is no longer possible! Only screw the set point adjuster up to the point where the spring tension can still be felt!*

How to proceed:

1. Loosen the lock nut (11, width across flats 17 mm) to allow the set point adjuster to move freely.
2. Determine the difference between the fixed set point (Table 1) and the required set point. Turn the set point adjuster (10) the required amount of turns as specified in Fig. 3.

Based on the default setting, any subsequent change to the set point can be also be made by determining the required number of turns using the specifications listed in Table 1.

3. Lock the setting with the lock nut (11).

Table 1: *Set point adjustments (default settings)*

Set point range	1 to 8 bar	5 to 25 bar	8 to 40 bar
Adjusted to ...	3 bar	12 bar	25 bar
Set point change per turn	1 bar	2.5 bar	3.5 bar

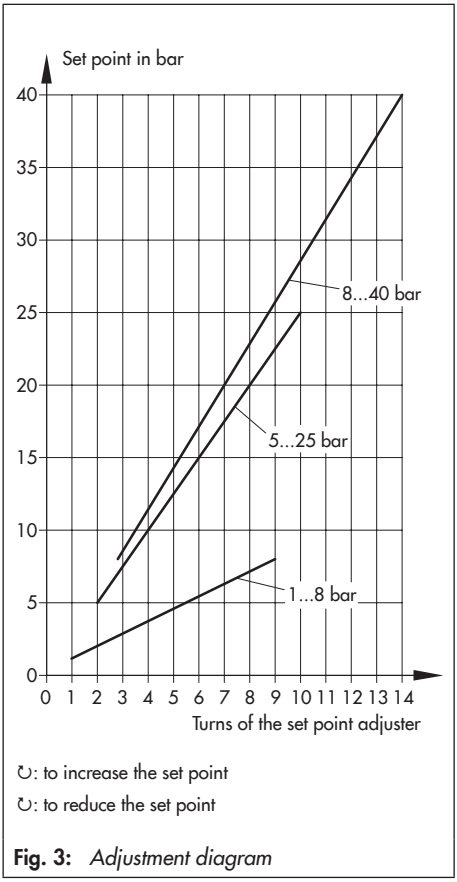


Fig. 3: *Adjustment diagram*

5.3 Decommissioning

Close first the shut-off valve on the upstream side of the valve and then on the downstream side of the valve.

6 Maintenance

The regulators do not require any maintenance. Nevertheless, they are subject to natural wear, particularly at the seat, plug and operating diaphragm.

Depending on the operating conditions, check the regulator at regular intervals to avoid possible malfunctions.

WARNING!
Process medium can escape uncontrolled on dismantling the regulator. Risk of cold burns!
Allow the regulator to defrost before depressurizing and draining it and remove it from the pipeline.

Check the filters in ports A and B for dirt and, if necessary, clean them.

If faults or malfunctions cannot be remedied, contact SAMSON (see section 7).

6.1 Changing the set point range

The set point ranges adjusted in the factory can be changed by changing the set point springs (8) and operating diaphragm (3) (▶ T 2570 EN · Spare parts and accessories).

How to proceed:

1. Loosen lock nut (11) and completely relieve the tension from the set point springs (8) by turning the set point adjuster (10) counterclockwise.
2. Place the lower section of the body (9) into a vise, but do not clamp it. Preferably use a box wrench (size 55 mm). Unscrew the body (1) using an open-end wrench (size 36 mm) and remove all parts from the lower section of the body. Be careful not to damage the operating diaphragms (3).
3. Place set point spring(s) for the required set point range, spring plate (7), ball (6) and diaphragm plate (5) into the lower section of the body.
4. Place the required number of diaphragms onto the diaphragm plate. Replace the PTFE gasket (4.1) of the valve body, if required.
5. Carefully place the body onto the lower section of the body.

   Tightening torque approx. 250 Nm

7 Customer service

If malfunctions or defects occur, contact the SAMSON After-sales Service Department for support.

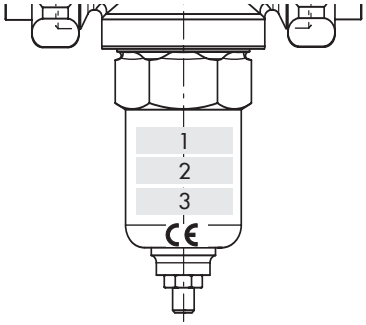
The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on the SAMSON website (▶ www.samson.de), in all SAMSON product catalogs or on the back of these Mounting and Operating Instructions.

Please send your inquiries to: service@samson.de

To assist diagnosis and in case of an unclear mounting situation, specify the following details (see section 8):

- Type designation with index
- K_{VS} coefficient
- Upstream and downstream pressure
- Customer-specific details
- Temperature and process medium
- Min. and max. flow rate
- Is a strainer installed?
- Installation drawing showing the exact location of the regulator and all the additionally installed components (shut-off valves, pressure gauge, etc.)

8 Nameplate



Details on lower section of body

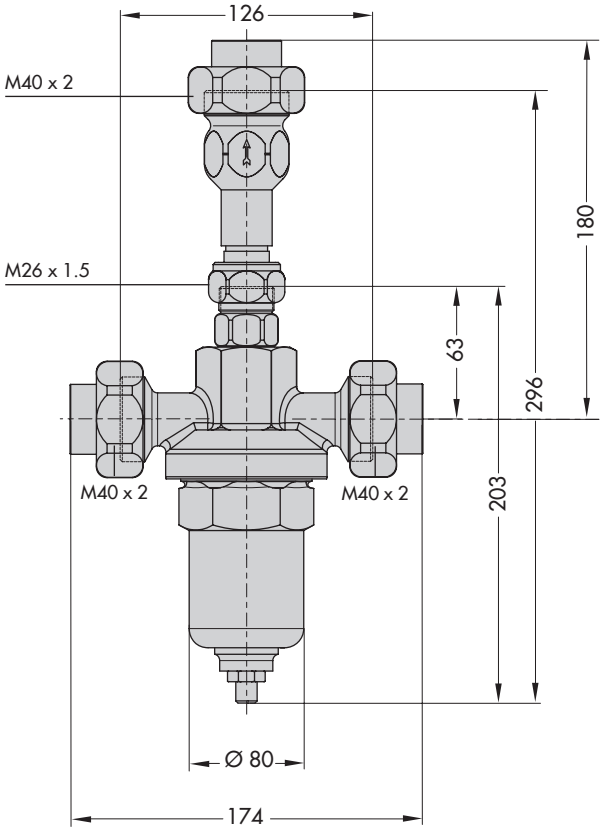
1 Set point range/date of manufacture
2 Type designation with index
3 Customer-specific details
CE compliance

Fig. 4: *Nameplate details*

9 Technical data

Type 2357-31		**Process medium in the gas state**
Nominal pressure		PN 50
K_{VS} coefficient Pressure build-up Pressure reduction		 0.8 0.2
Set point range		1 to 8 bar · 5 to 25 bar · 8 to 40 bar
Max. permissible operating pressure		50 bar
Safety function		5 bar above the set point
Excess pressure function	Heat leak	Approx. 0.5 bar above the set point
	Filling the tank	Approx. 5 bar above the set point
Temperature range		–196 to +200 °C
Weight, approx.		3.5 kg
Connections	A, B	M40 x 2
	C	M26 x 1.5
	Non-return unit	M26 x 1.5/M40 x 2

10 Dimensions



Type 2357-31 · Version with soldering nipple (accessories) and non-return unit (accessories)

Fig. 5: *Dimensions in mm*

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